

NRC / IRAP Overview

ATP Advisory Committee

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National Research
 Council Canada
 Conseil national
 de recherches Canada

NRC - A National Institution

24 institutes & centres (& IPF)
 3,600 highly skilled staff
 1,300 guest workers
 \$655 million budget, \$134 M
 Revenue (IRAP \$150M)
 Over 500 international
 collaborative agreements in
 2001-2002
 84 spin-offs, + incubators

NRC Institutes and Centres
 IRAP Offices

Structural Organization

Research and Technology Development

- [Biotechnology Group](#)
- [Manufacturing Technologies Group](#)
- [Information and Communications Technology Group](#)
- Measurement Standards
- Transformational Sciences
- Nanotechnology
- Research Support Office

Technology and Industry Support

- Astrophysics Facilities
- Construction Technologies
- Aerospace Technologies and Facilities
- Marine Sector & Facilities
- **Industrial Research Assistance Program**
- Canada Institute for Scientific and Technical Information
- 2 Technology Centres

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International Collaborations

- Over 1,000 ongoing informal collaborations (researcher-to-researcher)
- 48 MOUs at corporate level with foreign sister organizations
- 100s international bilateral collaborations and alliances at Institute and Program level
- Increasing trend in international cooperation resulting from globalization
- Several MOUs, letters of intent and collaborative agreements with various countries
- IRAP linked to 7 MOUs

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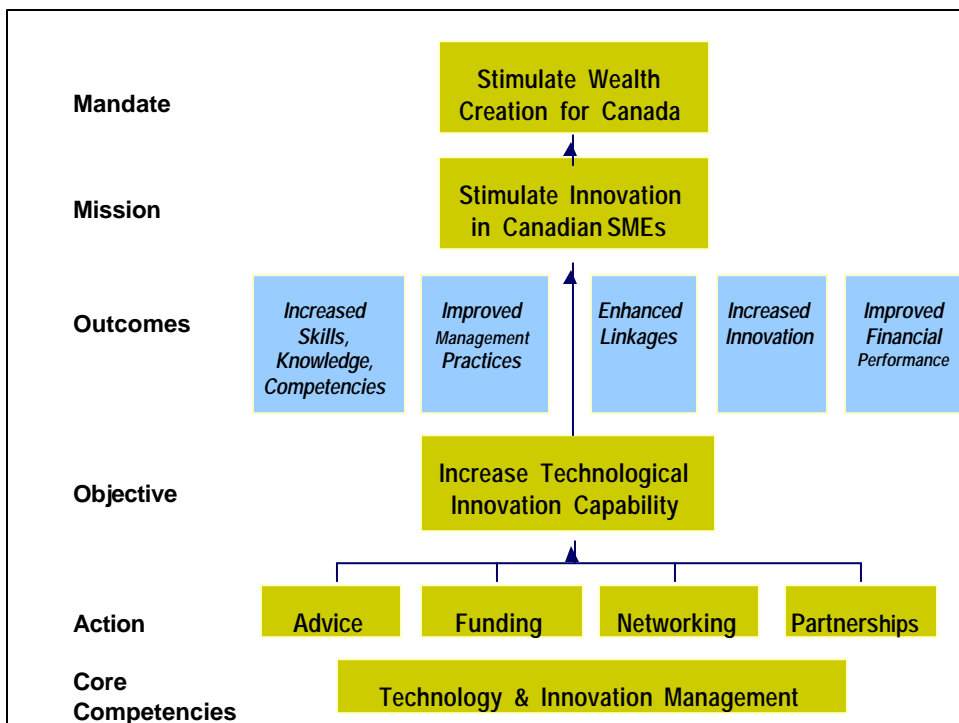
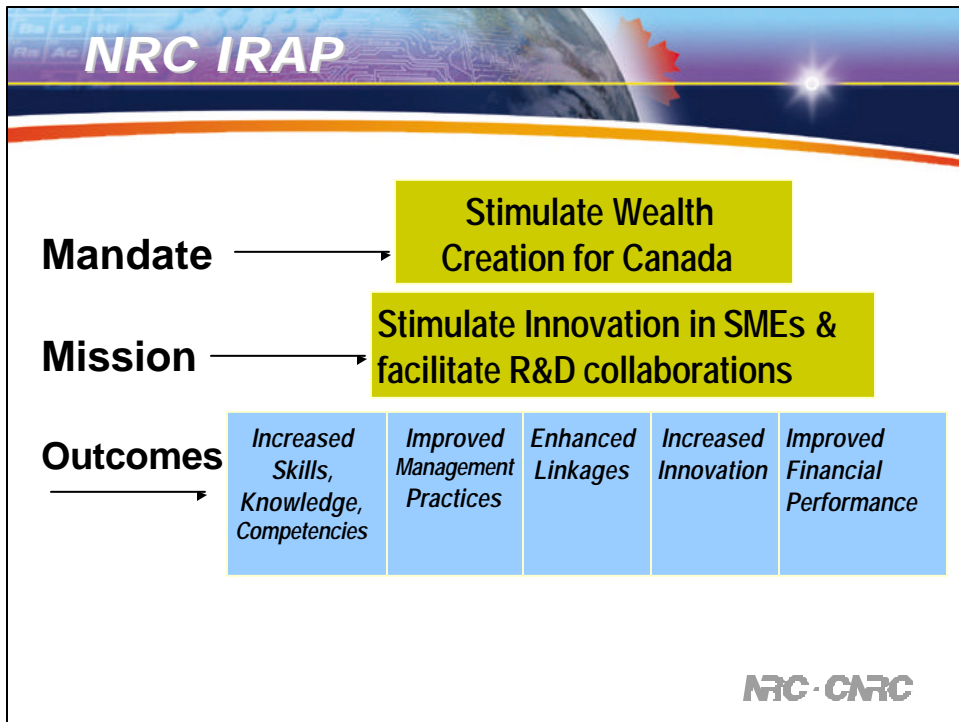
Canada's World's Firsts

- World's first Bus powered by hydrogen **Fuel Cells** - Ballard
- Aircraft Flight Recorder – “**Black Box**” - NRC
- World's first Satellite capable of reading through cloud and smoke cover - **RADARSAT**
- World's first **Vaccine** against **Meningitis** - group C - NRC
- The world's fastest national Optical R&D Internet – **CANARIE**
- World's first **Mechanical Heart** small enough to fit into the chest cavity with no wires through the skin – 2004?

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INDUSTRIAL RESEARCH ASSISTANCE PROGRAM (IRAP)

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WHAT IS IRAP?

CREATED in 1962, ADVISORY SERVICE 1947

Focus Technological Innovation

- NO Sector Focus - Client driven
- 12,000 Clients per year with Advice
- 3,300 Funded projects in 2,800 firms
- 260 ADVISORS in 110 ORGANIZATIONS

Delivery

Advice - 50% time of INDUSTRIAL TECHNOLOGY ADVISOR (ITA)

- SMALL projects - \$15 K – Decision: 10 Work days
- LARGER projects - \$350 - 500K – Decision 30-90 days
- (succeed 80% of time)

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IRAP Budget FY 2002 / 03

• PROJECTS (share 33 - 50%)	\$100 M#
• ADVICE & SUPPORT	<u>\$ 50 M</u> *
TOTAL	\$150 M @

\$30 M in Repayable Contributions

* \$27 M for Network Members; ~ \$4 M for Canadian Technology Network

@ \$100 M is core funding, the rest on 5-Year Allotments

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IRAP FUNDING LEVELS

BASIC:

- Salary - 80-100% technical staff
- Consultants - 50-75%
- Subcontracts - 50% of total or 80% salary
- Net total up to 50%

TYPICAL PROJECT: Contributions

- 1 - 3 years
- \$15 - \$100 K (to a maximum of \$350 K)
- \$98M (2001-02); 2,841 firms; 12,400 for \$ & advice
- Conditionally repayable loan: up to \$500K
- Also: Youth Program & Technology Visits Program

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ACCESS to LABORATORY NETWORK

- IRAP PAYS FIRMS UP TO 75% for TRAVEL to GOVERNMENT & UNIVERSITY LABS
- FIRM MAY CO-LOCATE ITS STAFF in GOVERNMENT LAB. for PART of PROJECT
- FOREIGN TECHNOLOGY:
 - USE: - NRC ADVISORS
 - FOREIGN AFFAIRS
- Technology Inflow Program ~ 177 Proj./Yr

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IRAP PROJECT SCOPE

- Feasibility studies
- Pre-project marketing
- “R” research
- Proof of concept
- Small “d” development
- Small “d” pilot demo
- Adaptation
- Pre-Competitive Development - Loans

NOT:

- Marketing entry
- Final engineering
- Full scale*
- Regulatory approval

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TECHNOLOGY ENHANCEMENT

- Small-scale projects (less \$15 K)
- Develop innovation capabilities
- Aimed at SMEs, industry associations
- Ability to support skills development training, students
- Evaluate, demonstrate, strengthen technologies
- Problem solving capacity
- Technology assessment and inflow
- Exploratory visits for R&D collaboration (EU FP6 & Intelligent Manufacturing Systems Programs)

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RESEARCH, DEVELOPMENT & ADAPTATION

- Contributions up to \$350 K
- Applied R&D, technology adaptations
- Projects focus on improving technical position
- R&D emphasis on advancing unproven technology - proof of concept
- Transfer of proven technology for adaptation
- Ability to support partnership projects amongst SMEs & collaborations with larger firms
- Relevance to national needs, national-level assessment, coordination

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RDA ASSESSMENT

COMPANY: Size, Business Strategy, Financing

INNOVATION LEVEL & CAPACITY to GROW

1. **TECHNICAL SCOPE:**
 - a. Innovation
 - b. Incrementality
2. **TECHNICAL RISK:**
 - a. Research Content
 - b. Technological Challenge
3. **SOUNDNESS of APPROACH:**
4. **Structure: Tasks, Budgets and Timing**
5. **RESOURCES:**
 - a. Qualifications of Research Team
 - b. Facilities & Equipment
6. **JOBS, MARKET**
7. **INCREMENTALITY**
8. **RECOMMENDATION OF TEAM**

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IRAP COMPANY ELIGIBILITY

- **ALL COMPANIES:**
- Incorporated in Canada
- Engaged in technology with base in physical, life sciences or engineering
- Financially sound
- Able to exploit results in Canada
- Realistic markets
- FOR PROFIT
- SMEs- PRIMARILY; 500 STAFF LIMIT *
 - TYPICALLY 5 - 25 STAFF
 - START- UPS with POTENTIAL
- NOT RESEARCH FIRMS (but USED as SUBCONTRACT)
- NOT "SHELL COMPANY" - USE PARENT

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IRAP PROJECT EXPENDITURES 2000/01

<u>IRAP by Industry Sectors FY 2000/01</u>	<u>#</u>	<u>\$ M</u>	<u>%</u>
<u>Information & Communications</u>			36%
• Software	446	14.1	
• Communications	317	10.5	
• Electronics / Electrical	264	9.4	
<u>Life Sciences</u>			20%
• Bio / Pharmaceuticals	174	5.1	
• Medical	117	4.1	
• Agric. & Food / Aquaculture	561	9.5	
<u>Manufacturing & Materials</u>			20%
• Advanced Materials	141	3.3	
• Machinery	130	2.5	
• Manufacturing	410	7.6	
• Metals/ Wood / Textiles / Construction	138	2.1	
• Chemical	145	3.1	
<u>Energy</u>	108	4.2	5%
<u>Environment</u>	174	3.2	3%
<u>Other</u>			16%
• Services / Consulting / Testing	221	4.7	
• Other - Defined	169	2.8	
- General	362	7.2	
<u>TOTAL</u> - in 3382 Firms	3877	93.4	

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IRAP - TPC

- **Repayable contribution**
- **Up to 1/3 of *eligible* costs of project**
- **To a maximum of \$500,000 (max project size \$1.5M)**
- **Focused on the pre-competitive development of new or significantly improved products, processes or services**
 - Environmental Technologies
 - Aerospace and Defense
 - Enabling Technologies
- **237 projects representing 100 M\$**
- **50% of PA projects will start repayments in 2002-03**
- **90% of respondents (clients and ITAs) had positive experience with program**

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Criteria for IRAP-TPC (PA) contribution:

- Client is an SME (500 employees or less)
- Eligible project cost is \$1.5M or less (TPC supports projects with \$1.5M or more)
- Project is a sound technical and business opportunity
- The company has or can be expected to acquire necessary resources and expertise
- IRAP-TPC (PA) contribution is proved to be necessary to the success of the project
- Exploitation of the technology will support the repayment of the contribution
- The project's economic benefits to Canada warrant government investment
- IRAP-TPC (PA) is delivered to firms through ITAs.

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PA Repayment

- A repayment method based on royalties linked to the firm's total sales revenues
- A fixed term is usual
- Launch period: normally 2 years
- Repayment period: normally 5 years

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IRAP & International

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The Value of International S&T

- Government of Canada has recognized the critical importance of international linkages.
- Federal strategy noted necessity of extending international S&T links.
- Prime Minister's Advisory Council on Science and Technology (ACST) determined that international S&T is a key component of wealth creation and quality of life.

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International Initiatives:

IRAP Strategic Plan 2003 – 2008:

- International is 1 of the 5 strategic pillars

Initiatives:

- 200 Technology Inflow & Partnerships visits
- Technology Missions (in & outgoing)
- Larger R&D projects
- Leverage R&D investments from other organizations & countries (via MOUs)

Therefore, IRAP will be able to undertake & leverage more international collaborative projects

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Some Benefits - International

- **Survey of 19 Prior Missions:**
 - Asia, Europe **\$1 - IRAP → \$100+ Benefits**
 - ~ **\$160M Sales, Collaborations and Investments**
- **Austria** → 5 firms reviewing Canada – One JV now in QC
- **Hannover 2001** → 11 SMEs (from ON / QC/ AB/ BC)
- **Team Canada** → Germany 12 IRAP clients of 200 firms
 - APACK, PEI, → JV for 40 jobs
 - To replace meat trays made of Styrofoam by potato starch based polymer → biodegradable
 - Polyplan - Montreal Univ spin off → \$6M deal Siemens

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Investing in Innovation- IRAP Strategic Plan 2003 - 2008

International represents 1 of the 5 strategic pillars

Targets:

- Double financial contributions & grow SMEs to medium sized firms
- Double IRAP reach to 24,000 clients/y
- Firms generate \$20 in sales for \$1 invested by IRAP
- Innovative, risk-taking SMEs will have a 20% higher survival rate
- 25% IRAP SMEs will be ready to pursue international technology opportunities & alliances

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Evaluation & Audits

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EFFORT - IRAP EVALUATIONS & AUDITS

- **Annual: Performance Report**
 - Sample Audits - 100 Internal files**
 - 170 Desk reviews < \$15K IRAP
 - 150 visits to firms
 - 5-7 Years Evaluation :** NRC Board of Directors – “Council”
 - Lead is NRC Corporate, with Consultants but do NOT provide NRC with individual client response data
 - Input to New Strategic Plan
- **5-10 Years:** Auditor General reports results to Parliament
 - Costs, Benefits, Due Diligence and Mandate

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EVALUATION ACCOMPLISHMENTS

- 4,038 PROJECTS - **1991** Reviewed in 1995
 - \$1 of IRAP ==> \$20 SALES in First 3 YRS
 - **Similar** Results for 484 projects in **1978-82**
 - \$9,000 / JOB, NET of INCREMENTALITY & ATTRIBUTION, (did not address Displacement – but deemed to be small)
- POSTCARD SURVEYS on NEEDS & SERVICE >75%
 - INCREASING IMPORTANCE for \$\$s vs Advice
- IMPACT STUDIES
- UNIVERSITY SPIN OFF FIRMS – 816 Cases

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EVALUATION ACCOMPLISHMENTS - 2002 STUDY

- Period: 1995 – 2000:
 - **9,158 Funded Clients** with **14,564 Projects**
 - **\$385 M** in IRAP funds (ave. \$26,400 / project)
- 684 Completed questionnaires, that covered
 - 7% of Projects
 - 9% of Funds
- International Benchmark – 6 Countries
- IRAP Evaluation Report Recently Completed (1996-2001)
 - 12,364 projects
 - 12,025 jobs attributable to IRAP (~\$32K/job)
 - \$4.2 B sales attributable to IRAP; 11:1 IRAP

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Outcome Measures

- IRAP Changes:
 - Mission: Build Technical and **Innovation** Capability inside the **Firm**:
 - rather than building **Technical** capability
 - focus was on specific Project outcomes
- Technical Outcomes
 - Licenses, Patents, New Products and Processes, Outside Financing
- Jobs, Jobs.
- → Moved from assessing Sales and Exports

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3 Discount Factors when Assessing Program Impacts

- **Incrementality: “ What would occur differently if IRAP funding were provided” ?**
- **Attribution of Benefits shared due to other sources of Downstream Funding**
- **Displacement of Products / Processes**
 - Inside the firm
 - For other firms

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INCREMENTALITY

“ What would occur differently if IRAP funding were provided?”

i.e. What leverage will government funding provide to start the project, and the level of funding to make it work well?

- Discount results if <100% ? Debated: Auditor General

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IRAP Int'L Benchmark Review 2002

- Consultants Benchmarking IRAP with like Programs in 14 countries.
- With In-depth reviews in 6 countries:
 - France
 - USA
 - Finland
 - Australia
 - Hong Kong
 - U. K.
 - ANVAR
 - Manufacturing Extension Program
 - Advanced Technology Program
 - SBIR
 - TEKES
 - R&D Start Program
 - SERAP
 - Business Link

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New Products

Compared a Statistics Canada study in 2000 of 9,000 Firms in Manufacturing Sector with IRAP in 1996-2001

Company responses for their New Products deemed to be:

	<u>IRAP</u>	<u>Can. Manuf. Firm*</u>
•World First	37%	10.6%
•Canada First	66%	28.5%
•Company First	96%	73.5%

* Covered Manufacturing firms with 25+ employees

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Why is IRAP Successful?

- IRAP widely recognised as an effective provider of innovation support for SMEs (ACST recommendation, evaluations, etc.,)
- Proven track record- since 1962
- Flexible and decentralized organization
- Regional representation (160 offices)
- Responds to the needs of local businesses - technology pull vs. push
- Decision-making takes place at a regional level
- In contact with innovation resources in Canada and around the world – leverage international linkages

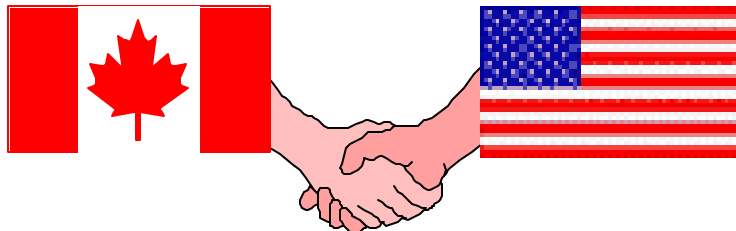
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HOME PAGES on WWW

- NRC National Research Council
<http://www.nrc-cnrc.gc.ca/>
- IRAP: http://irap-pari.nrc-cnrc.gc.ca/english/main_e.html
- CTN Canadian Technology Network
<http://ctn.nrc.ca>
- Canadian Federal Laboratories
<http://scitech.gc.ca/fptt>
- University I. P. and 467 Spin Offs -1999
<http://www.statcan.ca/english/>
- Adv. Coun. S&T <http://acst-ccst.gc.ca>
- Strategis <http://strategis.ic.gc.ca>

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Thank you / Merci



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CANADA: An Attractive Business Environment

- High growth economy, balanced fiscal situation, low inflation and low interest rates
- Lowest R & D costs in the world
- Competitive business costs/exchange rate
- World class universities
- Highly skilled work force at relatively low cost
- NAFTA access to a consumer base of almost 400 million

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Report of ACST Committee on International S&T - Some Findings

SMEs need International Linkages:

- Canada produces ~4% world's R&D
- access best expertise, equipment, markets and establish networks
- > 65 % technologies from outside Canada
- Canada leads G-7, Japan & US in No. of patents with International partners
- Canada in 4th place in No. of International technological alliances

Recommendation to the Prime Minister:

- \$20M /y for 5 years to IRAP – support SMEs internationally

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Benefits to Canada Clause

- Firm is limited from selling technology outside of Canada for 5 Years after end of funding period.
 - Some releases negotiated but NOT upfront, unless IRAP project linked to international programs - EU or IMS projects
- Increased demands for release of technology outside Canada
- rational for use of government \$\$s for Public Benefits and not primarily for Personal Benefits.

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Assessment of IRAP - Lipsey 1999

A UNCERTAINTY		
1	Large leaps are dangerous	S
2	Successful policies pursue incremental innovation	S
3	Pushing technology off its trajectory is dangerous	S
4	Flexibility is important	S
5	Diversity is the best protection against uncertainty	S
6	Uncertainty can be reduced by exploiting the interrelation between users & producers	S
B DESIGN PITFALLS		
7	Multiple objectives are dangerous	S
8	Multiple objectives are sustainable with multiple tools	S
9	Multiple objectives should be clearly prioritised	S
10	National prestige is an outcome not an objective	S
11	Programs should avoid capture	S
C STRUCTURAL RELATIONSHIPS		
12	The relationship between technology and structure is important	S

S = Success
 QS = Qualified Success
 U = Uncertain
 QF = Qualified Failure
 F = Failure
 NA = Not Applicable

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Assessment of IRAP Lipsey 1999

C STRUCTURAL RELATIONSHIPS		
12	The relationship between technology and structure is important	S
13	Programs can be useful in coordinating precommercial R&D	U
14	Policies should maximise positive spillovers	QS
D MARKET FORCES		
15	Market forces should be utilised wherever possible	S
16	Information coordination and dissemination are important	S
17	Commercial viability should be sought	S
18	Policies should exploit as much expertise as possible	S
19	Competition inducing mechanisms increase the chances of success	QS
TOTAL SUCCESSES		16

S = Success
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 F = Failure
 NA = Not Applicable

Leverage: Attributable sales to IRAP \$ = 20:1

IRAP Cost /job = \$10,000

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R & D Tax Credits

- Canada has one of the most Generous Scientific Research & Experimental Development Programs (KPMG and OECD Studies)
 - 20% ITC for all firms
 - 35% ITC for Small firms
 - as **Cash** if in Tax Loss
 - 11,000 Claimants / Year
- Funds

- Federal	=	\$1.3 Billion
- Prov'l	=	\$0.4 "
- Net After Tax Cost with IRAP = 28 - 35 cts

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Key Investments in Industrial Innovation by the Canadian Government

- **Industrial Research Assistance Program (IRAP) \$150 M**
 - **\$25 M x 2 Years in REFINANCING – no net new funds**
- **Technology Partnerships Canada (TPC) \$300 M**
 - **IRAP co-delivers for small projects in SMEs**
- **Program for Energy Res & Devel't (PERD NRCan)**
- **Business Development Bank of Canada (BDC)**
 - **\$200 M in new Venture funds in Federal budget**

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Technology Partnerships Canada (TPC)

- **Pre-commercialization technological development (\$300 million / year)**
- **Primary focus on;**
 - **Enabling Technologies (Biotech, Software, Advanced Materials and Manufacturing),**
 - **Aerospace and Defence,**
 - **Environment Technologies**
- **TPC shares in the rewards, as well as the risks**
- **Contributions are conditionally repayable, usually based on royalties tied to product sales**

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WHO is an ITA?

INDUSTRIAL TECHNOLOGY ADVISORS ARE:

EXPERIENCED	10+ years in industry Mostly engineers Generalists, some specialists
DECENTRALISED	110 Locations Autonomous & empowered Self-driven
TRAINING	2-5% retraining
VACANCY	Low turnover

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